Space Weather Forecast

Issued on Monday, 24 April 2023 at 01:17 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Strong or Severe geomagnetic storm early on Day 1 (Monday 24 April). Slight chance of Moderate-class flares (R1-R2; Minor-Moderate radio blackouts) throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low over the past 24 hours, with only a few minor C-class flares observed. There are currently five numbered sunspot regions on the visible disc. AR3282 is the largest region on the disc, which is becoming difficult to analyse as it approaches the northwest limb. AR3285 in the southeast is second largest with little change. The remaining sunspot regions remain small and stable, including a new and currently unnumbered sunspot region in the far southeast.

The large full-halo CME (Coronal Mass Ejection) that left the Sun on Friday evening at 21/1812UTC from an Moderate-class flare and associated filament eruption (arc of plasma) from near centre-disc arrived at Earth shortly after 23/1700 UTC.

Solar Wind / Geomagnetic Activity: The solar wind has declined from slightly elevated to Slow levels. The associated magnetic field was stable and at weak levels until around 23/0800UTC when levels became moderate. The all-important north-south component of the field was also mostly at weak levels until late in the period when moderate levels were reached. The net effect of the above solar wind measures was for Quiet to Unsettled (Kp1-3) geomagnetic activity. The solar wind was initially at background levels, but increased significantly to Elevated or Strong levels, briefly reaching Very Strong levels, with the arrival of the CME, with a peak speed of near 800km/s observed at 23/2140 UTC. The magnetic field was initially weak, increasing to strong or very strong with the arrival of the CME. The all important north-south component (Bz) became strongly southward directed as the CME arrived. The net effect of the above solar wind measures was initially Quiet (Kp1-2), with geomagnetic activity increasing to G1-G2 Minor-Moderate Storm (Kp5-6) observed between 23/1200-1800 UTC, strengthening to a G3-G4 Strong to Severe Storm (Kp7-8) between 23/1800-0000 UTC.

Energetic Particles / Solar Radiation: A minor solar radiation storm (S1) was observed at 23/1820 UTC due to the arrival of the CME, before declining to slightly elevated levels. Energetic particles are likely to remain slightly elevated during the next few days due to on-going CME effects and any solar flares from the sunspot region near the northwest limb.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is most likely to continue at Low levels of activity with a slight chance of Moderate activity, mainly due to the largest sunspot group but perhaps also from the second largest region in the southeast.

Solar Wind / Geomagnetic Activity: Earth is currently experiencing the impacts from the full halo CME, which left the Sun on 21 Apr, with solar winds at Elevated levels. Solar winds are

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likely to remain Elevated during day 1 (24 Apr) due to on-going CME effects, before declining to Slightly Elevated levels on day 2 (25 Apr), perhaps briefly reaching background on day 3 (26 Apr). A gradual increase to Slightly Elevated levels are likely on day 4 (27 Apr) due to the arrival of a fast wind from a negative coronal hole

Geomagnetic activity will be initially at G3 Strong Storm levels (Kp7) with further G1-G2 Minor-Moderate storms (Kp5-6) Expected on day 1 (24 Apr) due to the on-going CME effects. Geomagnetic activity gradually reducing to Unsettled or Active intervals (Kp3-4) on day 2 (25 Apr), perhaps reaching Quiet to Unsettled intervals on days 3 and 4 (26-27 Apr) as CME effects continue to wane. However, a HSS from CH96 is Likely to arrive during day 4 (27 Apr) which may increase geomagnetic activity to Unsettled or Active intervals (Kp2-3), with Slight Chance of G1 Minor Storm (Kp 5).

Energetic Particles / Solar Radiation: A solar radiation storm (S1) has recently been observed, with a slight chance of further minor storms during days 1 and 2 (24-25 Apr) due to on-going CME effects and most likely due to the largest sunspot region if a significant eruption were to occur.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	90	40	10	10
Strong	G3	Yes	40	20	1	1
Severe	G4	Yes	10	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	30	30	20	20
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

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Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	Yes	50	20	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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